

QUESTIONS AND ANSWERS ABOUT WASHINGTON'S ELECTRICITY LANDSCAPE

SECTION 4

This section was developed in response to questions from the members of the Energy Strategy Advisory Committee and to questions raised in a report produced in Spring 2001, *Q & A Concerning Impacts of the Current Energy Situation on Washington State's Economy* (available at <http://www.energy.cted.wa.gov/Energy%20Q&A.pdf>.) This information is intended to help improve our understanding of the energy situation in Washington State, particularly in light of events that occurred during 2000/2001 as a result of the West Coast electricity and energy crisis.

The information is organized in four sections: the electricity/energy crisis, economic impacts of the crisis, electricity and natural gas consumption, and energy policy issues.

Each section contains indicators that illustrate a key issue and help to tell the story of the electricity landscape in Washington. These indicators are also examples of how the Department of Community, Trade and Economic Development (CTED) Energy Policy Division and other areas of state government can track and measure the achievement of the goals and objectives that emerge from the State Energy Strategy process.

The state energy indicators presented in this section differ from those included in the 1999 and 2001 Biennial Energy reports. These indicators focus on electricity, while the state indicators provide a view of Washington's overall energy landscape. The state indicators are in the process of being updated and will be posted on the CTED Energy Policy website.

The information is presented in a question and answer format. The following questions are considered:

Section 4-1: The Electricity/Energy Crisis

1. What was the impact of the drought on electricity supply?
2. What new electricity generation capacity has been added in Washington?
3. What is the electricity flow into and out of the region?
4. What happened to *wholesale* energy prices in Washington?

Section 4-2: Economic Impacts of the Crisis

5. How have retail natural gas and electricity rates in Washington changed as a result of the West Coast energy crisis?
6. As a result of the West Coast energy crisis, how do energy prices in Washington compare to other states?
7. How do retail electricity and natural gas rate increases affect Washington's "average" household and commercial business?
8. What is the relation of utility costs to household income?
9. What is the credit status of electric utilities in Washington?

Section 4-3: Electricity and Natural Gas Consumption in Washington

10. Where is growth occurring in electricity consumption in the state?
11. How does growth in electricity consumption and expenditures relate to other economic indicators?
12. Where is growth occurring in natural gas consumption in the state? Is there any evidence of increasing consumption for electricity generation?

Section 4-4: Policy Issues and Indicators

13. What is the mix of utility types in Washington?
14. How does new generation influence the diversity of generation in the state?
15. What is happening with the region's transmission system?
16. What is the impact of energy consumption in Washington on the production of greenhouse gases?
17. What is the level of energy conservation savings achieved in Washington?
18. What percentage of the electricity consumed in Washington is produced from non-hydroelectric renewable energy sources?

Each question is followed by a brief summary response, a description of the data (indicators) presented, and a series of annotated figures or tables responding to the question.

Section 4-1: The Electricity/Energy Crisis

The West Coast electricity/energy crisis that began late in 2000 and continued through most of 2001 government, utilities, businesses, and consumers came suddenly and had a significant impact on the state's utilities, consumers, and economy. Many factors contributed to this crisis including electricity market restructuring in California, market manipulation by some suppliers, and the drought in the Northwest. They combined to limit available electricity supplies and produce very volatile electricity markets. Four indicators illustrate the situation in the Northwest and Washington:

- ◆ the impact of the drought on electricity supply;
- ◆ new electricity capacity additions;
- ◆ flow of electricity into and out of the region (U.S. portion of the NW Power Pool); and
- ◆ wholesale energy prices in Washington.

The drought during this period significantly reduced hydroelectric supply, the primary source of electricity in the region. This limited available electrical energy in the Northwest and on the West Coast. While Washington has been adding modest amounts of generating capacity over the last 20 years to keep up with growth in electricity demand, there was not enough new or reserve capacity to fully mitigate the impact of the crisis.

The Northwest typically exports electricity to other areas, but during the crisis the amount of exports began to decline and the region imported power during the winter of 2001. In addition, wholesale electricity and natural gas prices were very volatile, increasing significantly beginning in late 2000 through mid-2001. The impact of these high prices is described in Section 4-2.

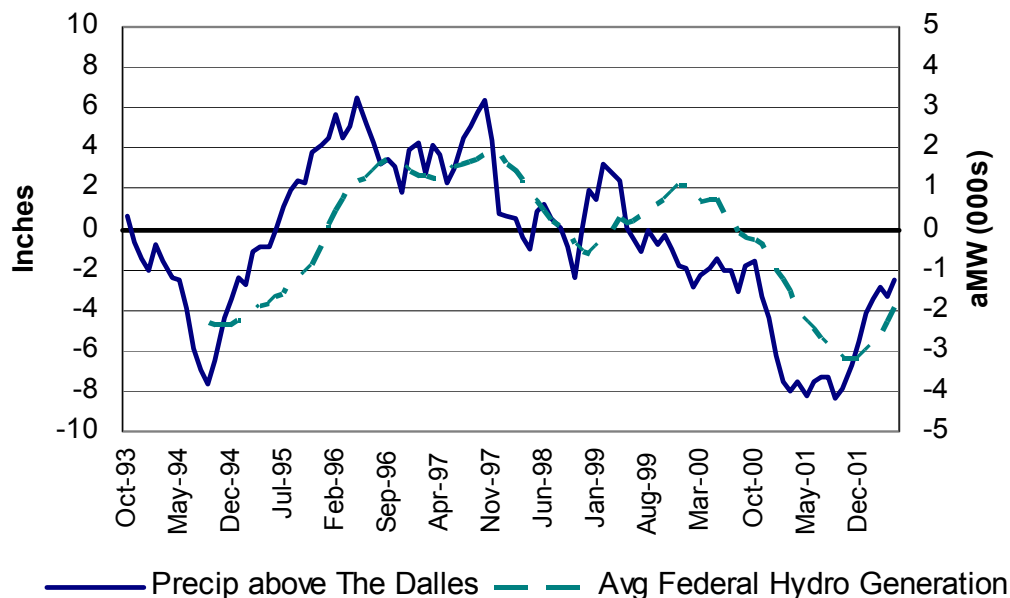
1. What was the impact of the drought on electricity supply?

Hydroelectric supply dropped significantly due to the drought. The electricity available from the hydroelectric system is dependent on regional precipitation and snow pack. The total supply of electrical energy available varies significantly depending on these factors. At the height of the drought, annual production on the federal hydro system was more than 30 percent below the historical average.

Indicator:

Variation in Federal Columbia River Power System (FCRPS) hydroelectric production relative to precipitation above The Dalles. [source: Bonneville Power Administration (BPA)]

Figure 4.1 Variations in NW Precipitation and Hydro Generation



Hydro generation production varies significantly depending on precipitation in the region. Generation capacity on the federal hydro system was 10 to 20 percent above normal during a relatively wet period in 1996 and 1997, but dropped 30 percent below normal by late 2001. For Washington, hydro generated electricity serving Washington consumers (which includes a portion of federal hydro generation plus other sources) dropped more than 30 percent from 2000 to 2001, which is equivalent to a decline in hydro generation capacity of 2,500 aMW.

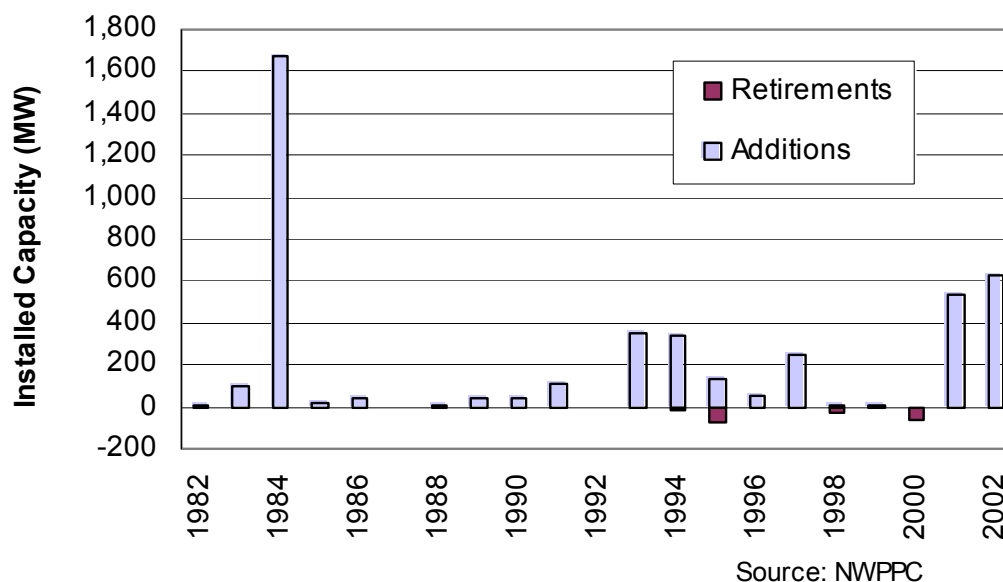
2. What new electricity generation capacity has been added in Washington?

Modest additions to generation capacity in Washington have been made in the last 20 years with the exceptions of 1984 when the Columbia Generating Station at Hanford came on line and 2001 and 2002 when more than a quarter of the total capacity added during this period came on line. At the same time, electricity load growth in Washington has been modest during this period and capacity additions have generally kept up with load growth.

Indicator:

Additions and retirements of electricity generation capacity in Washington for the last 20 years. Generation is shown in terms of installed capacity in Megawatts (MW). The actual production from a generation plant may be less than its installed capacity. [source: Northwest Power Planning Council (NWPPC)]

Figure 4.2 Washington Generation Additions and Retirements



A little more than 4,000 MW of electricity generating capacity has been added in Washington State in the last 20 years. Almost 40 percent of this capacity was added in 1984 when the Columbia Generating Station at Hanford came on line. Most of the remainder was added in the mid-1990's and in 2001 and 2002. These last two years account for a little more than a quarter of the total capacity additions. This does not include temporary diesel generators that were briefly operated during this period, but it does include several permanent diesel generators installed in 2001 to meet peak loads. During this period, electric load growth in Washington averaged less than two percent per year and the modest capacity additions in the state have kept up with this load growth. However, Washington is part of a regional electricity system. Whether this system has adequate capacity must be determined on a regional basis.¹ Also, the recent economic downturn has resulted in a significant decline in industrial electricity loads. As the economy recovers, growth in electricity use is likely to increase.

¹ See the Northwest Power Planning Council's analysis of regional electricity supply adequacy at <http://www.nwpcouncil.org/library/releases/2002/1211.htm>

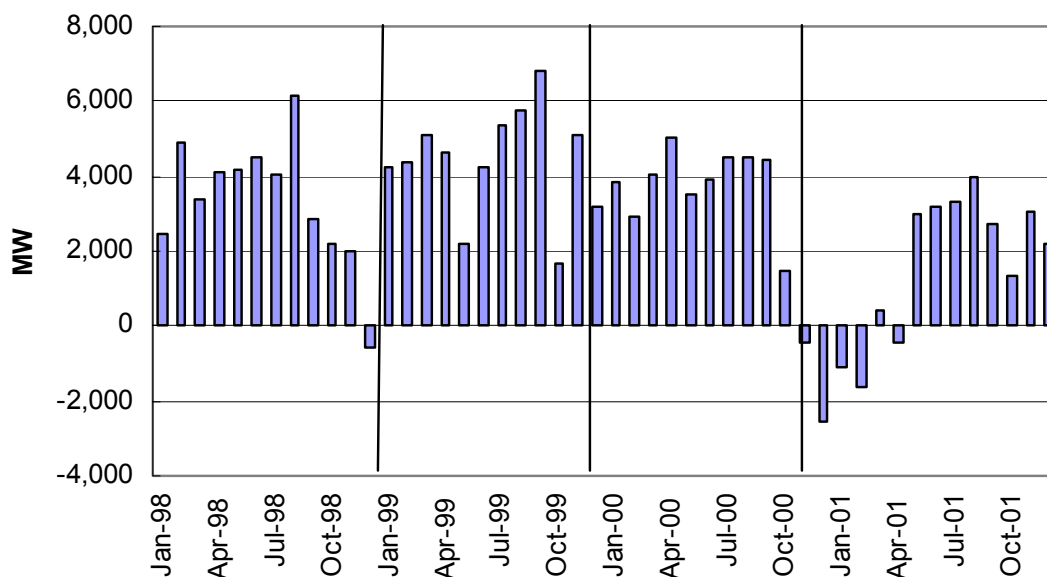
3. What is the electricity flow into and out of the region?

The Northwest Power Pool (NWPP)² is a net exporter of power during much of the year, although this changed in early 2001.

Indicator:

Net firm transfers of power from 1998 to 2001 for the U.S. portion of the NWPP. [source: NWPP]

Figure 4.3 Northwest Power Pool Net Firm Transfers 1998-2001



Over the last several years, the U.S. portion of the NWPP has been a net exporter of power (positive values in the figure). In 2000, the magnitude of exports began to decline and the region imported power during the winter of 2000/2001. Exports during the remainder of 2001 were somewhat less than previous years.

² NWPP area is comprised of all or major portions of the states of Washington, Oregon, Idaho, Wyoming, Montana, Nevada, and Utah, a small portion of Northern California, and the Canadian provinces of British Columbia and Alberta.

4. What happened to *wholesale* energy prices in Washington?

Wholesale energy prices on the spot market for electricity and natural gas increased significantly beginning in late 2000 through mid-2001. By late 2001, these prices returned to pre-crisis levels and spot market electricity prices for the first three-quarters of 2002 were generally below historical levels. Some utilities, such as BPA, which were exposed to high market purchase prices hoped to improve their financial situation by selling surplus electricity to the market as water conditions improved in late 2001/2002. Ironically, because spot prices fell at the same time, surplus sales revenue did not meet original projections.

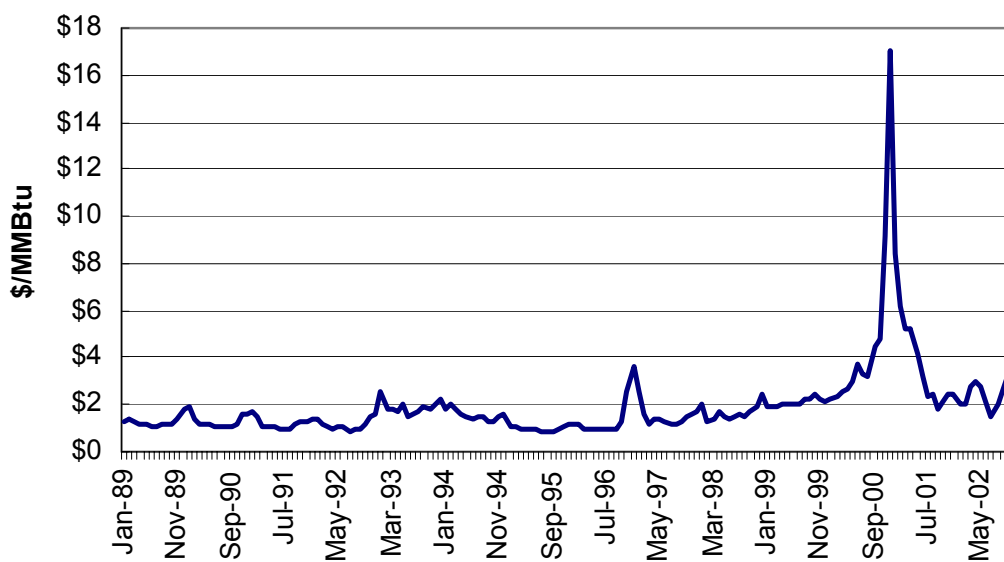
It is important to recognize that spot electricity markets are a relatively small portion of the total electricity market. (See Figure 4.7, "Washington State Electricity Consumption") Those utilities or consumers most exposed to spot market prices were most impacted by the increase in these prices.

Indicators:

- Historical monthly average natural gas spot prices at the Sumas, Washington hub. [source: Natural Gas Week]
- Wholesale monthly volume-weighted average spot market electricity prices at the mid-Columbia hub. [source: Dow Jones]
- Wholesale daily peak market electricity prices at the mid-Columbia hub. [source: Dow Jones]
- Washington electricity consumption compared to mid-Columbia volumes. [source: Dow Jones and Energy Information Administration (EIA)]

Figure 4.4 Monthly Average Natural Gas Spot Price

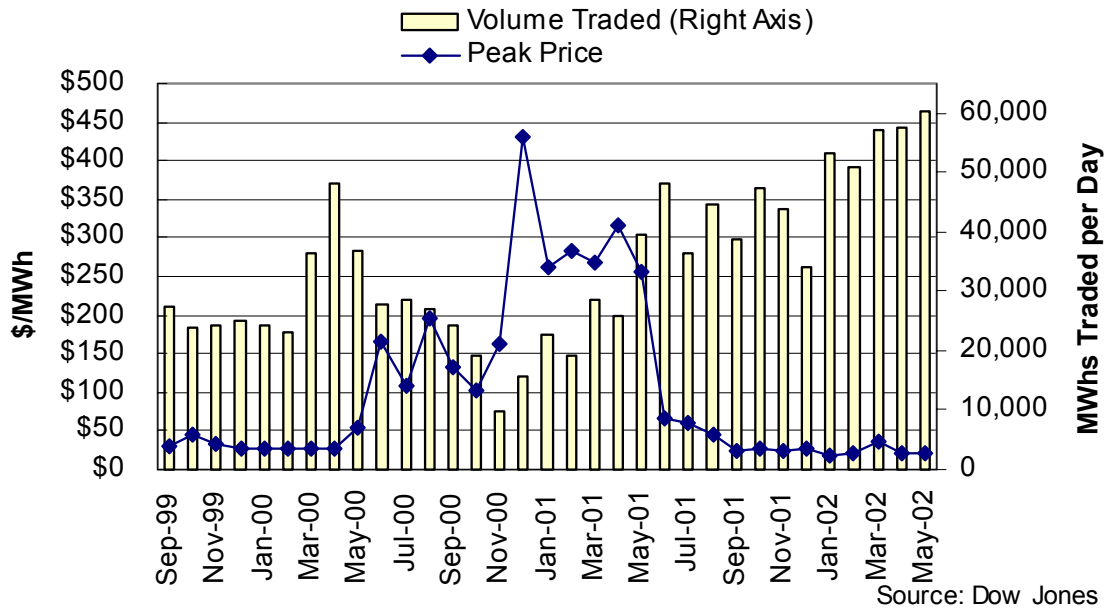
Delivered to Pipeline at Sumas, WA



Source: Natural Gas Week

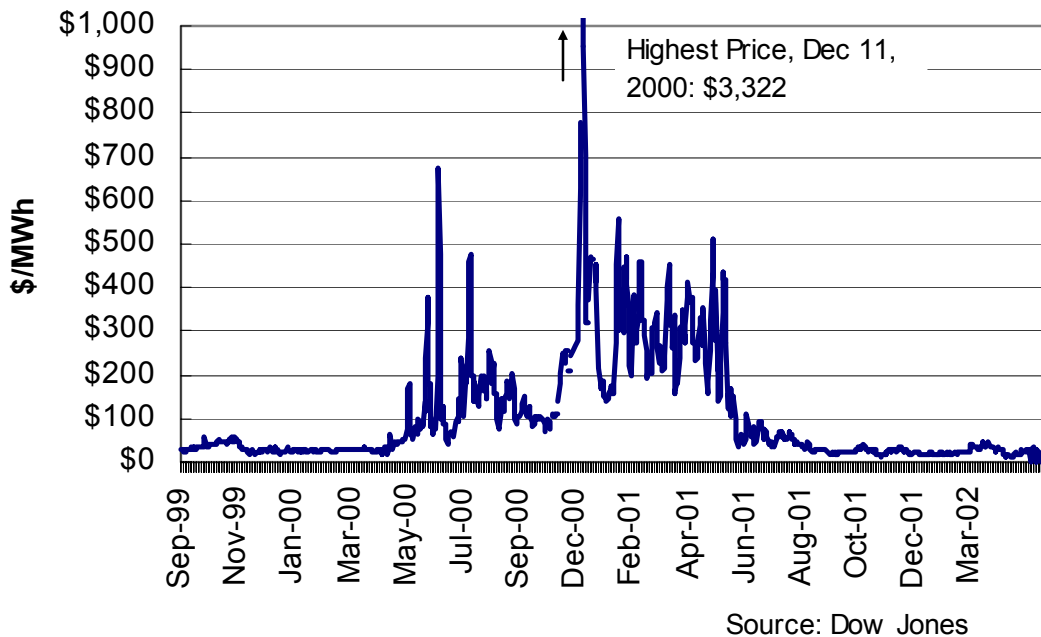
Historical natural gas spot market prices at Sumas have been less than \$2/mmBtu. Prices began to rise above this level in early 2000, peaking in December 2000. By September 2001 prices were nearing the \$2/mmBtu level, but by late 2002 had increased to more than \$4.00/mmBtu.

Figure 4.5 Monthly Spot Market Power Prices at Mid-Columbia
Monthly Volume-Weighted Averages



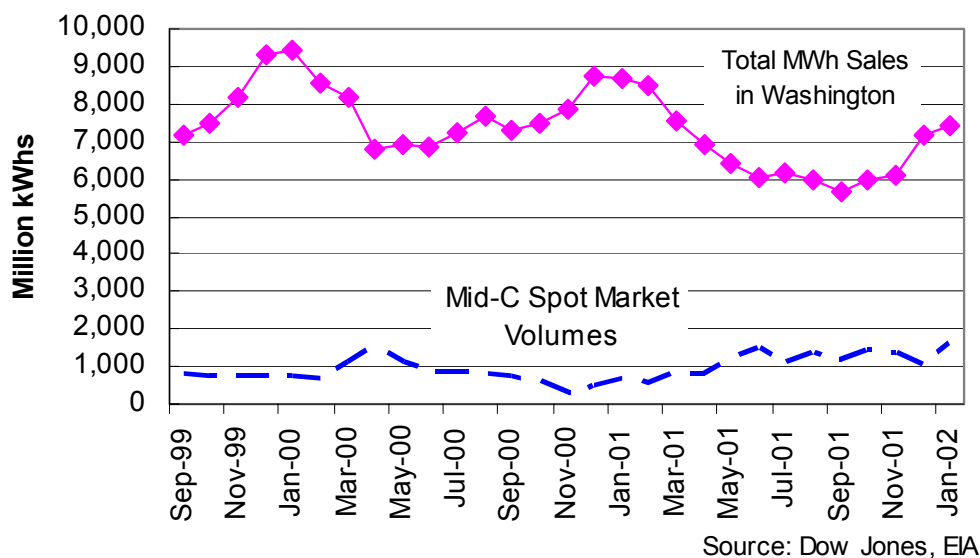
In mid-2000 monthly (volume-weighted average) spot market electricity prices at the mid-Columbia hub began to climb, peaking in January 2001. Peak values were more than an order of magnitude higher than historical prices. The volume of sales declined significantly during the period of high prices. By September 2001 prices had returned to historical levels and prices in mid-2002 even dropped below this level.

Figure 4.6 Daily Spot Market on-Peak Firm Electricity Prices at Mid-Columbia
September 1999 – June 2002



Daily peak spot market electricity prices at the mid-Columbia hub experienced even greater volatility than monthly prices from mid-2000 until late summer 2001. The peak price of \$3,322/MWh on December 11, 2000, was 100 times historical average prices. But by late 2001 and early 2002 prices returned to historical or below historical averages. Recent volatility has been less than during the crisis period, but somewhat greater than historic norms.

Figure 4.7 Washington State Electricity Consumption and Mid-Columbia Volumes Traded



The volume of electricity sales at the mid-Columbia hub is small relative to the total electricity sales in Washington State. Only a portion of the sales made at the mid-Columbia hub are for customers in Washington State. Spot markets are only a small fraction of the total electricity market.

Section 4-2: Economic Impacts of the Crisis

The dramatic increase in wholesale electricity and natural gas prices during the electricity/energy crisis had a significant impact on most of Washington's utilities and the prices they charge. Even though most utilities relied on wholesale electricity markets for only a small portion of their electricity needs, the order of magnitude increase in wholesale electricity costs dramatically increased their total costs for electricity. Those utilities that relied the most on wholesale electricity markets for power experienced the largest impact. These higher costs were eventually passed on to their customers. In this section we consider five indicators of the economic impacts of the crisis on Washington consumers and utilities:

- ◆ changes in retail natural gas and electricity rates;
- ◆ comparison of Washington's natural gas and electricity prices to other states;
- ◆ changes in the average household and commercial business natural gas and electricity bill;
- ◆ relationship of utility costs to household income; and
- ◆ credit status of Washington's electric utilities.

In 2001 and 2002, retail electricity prices experienced their most significant increase since the early 1980's (when prices increased due to the Washington Public Power Supply System (WPPSS) nuclear plant bond default). Residential and commercial prices were approximately 20 percent higher and industrial prices were almost 50 percent higher. Historically, Washington has had some of the lowest electricity prices in the nation, but now almost 20 states have lower average industrial and commercial electricity prices. However, these average numbers do not reflect the fact that some utilities, especially those with sufficient generating capacity to meet all of their obligations, experienced little or no price increases.

Likewise, natural gas prices were 40 to 60 percent higher in 2001 than in 1999. Unlike electricity, where some utilities did not experience large cost increases, all gas utilities in Washington saw significant increases. These higher prices translate into higher electricity and natural gas bills for Washington consumers. Low-income households in Washington are on average paying more than 5 percent of their income to meet their household energy needs (excludes transportation).

The energy crisis also has had a negative impact on the financial stability of Washington's electric utilities. Many Washington electric utilities have experienced credit downgrades and several of the major utilities have negative outlooks from Standard and Poor's. While all but one still have investment grade bond ratings, this situation can reduce utility access to affordable capital to make needed investments to the electricity system in Washington.

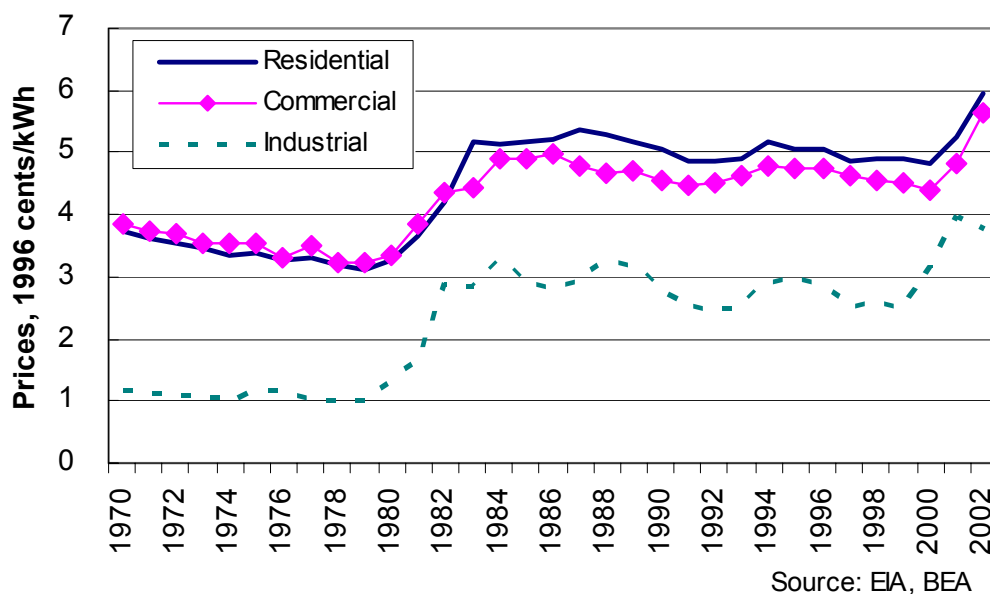
5. How have retail natural gas and electricity prices in Washington changed as a result of the west coast energy crisis?

Average retail residential and commercial electricity prices have increased approximately 20 percent since 1999 and industrial prices increased almost 50 percent. Natural gas prices for residential and commercial consumers increased about 60 percent from 1999 to 2001, while those for industrial consumers increased more than 40 percent.

Indicators:

- ◆ Average real retail electricity price trends by sector. [source: EIA and U.S. Department of Commerce Bureau of Economic Analysis]
- ◆ Average real retail natural gas price trends by sector (Natural gas prices for 2002 and 2001 (except residential) are not available.) [source: EIA and U.S. Department of Commerce Bureau of Economic Analysis]

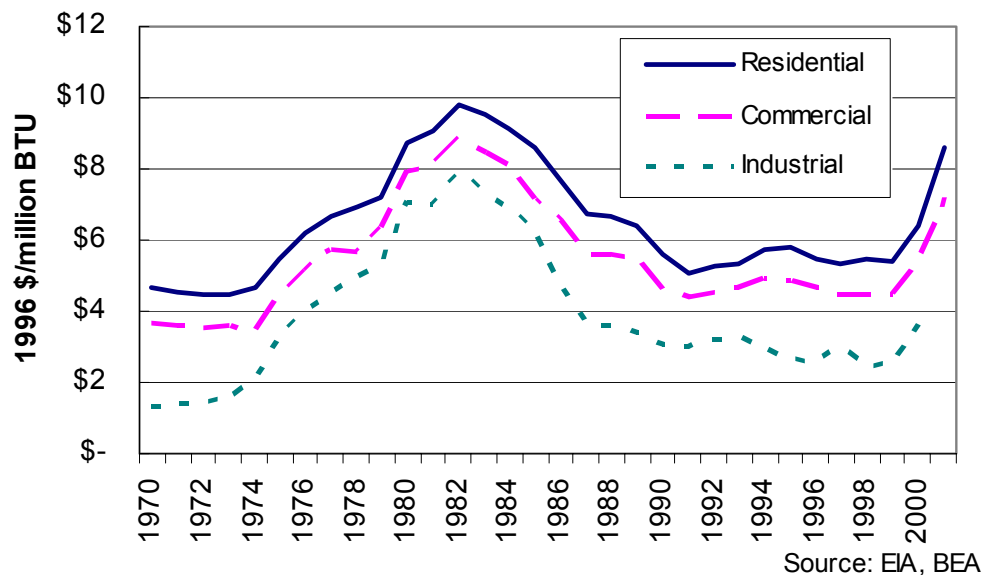
Figure 4.8 Washington Retail Electricity Prices by Sector



Note: 2002 values are year-to-date through June. Values for 2001 and 2002 are estimates and may be revised.

Inflation-adjusted average retail electricity rates have been relatively stable in Washington since the last significant increase in prices in the late 1970's and early 1980's. But prices began to increase for industrial consumers in 2000 and for residential and commercial consumers in 2001. Price increases were most dramatic for industrial customers rising more than 50 percent from 1999 to 2001 before dropping slightly in 2002. The increase in residential and commercial prices from 1999 to 2002 was 20 and 24 percent respectively (inflation adjusted).

Figure 4.9 Washington Retail Natural Gas Prices by Sector



After peaking in the early 1980's, inflation-adjusted retail natural gas prices declined through the late 1990's. Beginning in 2000, prices began to rise due to constrained natural gas capacity and increased demand. From 1999 to 2001, residential natural gas prices increased more than 60 percent and commercial prices increased by more than 70 percent. Industrial prices climbed by more than 40 percent from 1999 to 2000 (2001 values are not currently available). Comparable data for 2002 are not yet available, but natural gas prices have been falling recently.

6. As a result of the West Coast energy crisis, how do energy prices in Washington compare to other states?

Washington's relative advantage as a low-cost electricity state has been declining. In 1999, Washington had the lowest electricity prices for residential and industrial consumers and the next to lowest commercial prices. By 2002, nearly 40 percent of the states had lower commercial and industrial electricity prices and 15 percent had lower residential prices. Washington's relative ranking for natural gas prices changed from slightly lower prices than average for the commercial and residential sectors to prices that were similar to the U.S. average. Washington industrial natural gas prices were among the lowest in 1999. A few more states had lower prices in 2000 and data are not yet available for 2001.

Indicators:

- ♦ Washington's ranking for retail electricity prices by sector relative to other states. [source: EIA]
- ♦ Washington's ranking for retail natural gas prices by sector relative to other states (prices are not available (na) for 2002 and for the industrial sector in 2001.) [source: EIA]

Table 4.1 Washington State Ranking - Retail Electricity Prices

| | YTD 2002 | 2001 | 2000 | 1999 |
|-------------|-----------------|-------------|-------------|-------------|
| Residential | <i>44</i> | <i>49</i> | 50 | 50 |
| Commercial | <i>32</i> | <i>47</i> | 49 | 49 |
| Industrial | <i>33</i> | <i>34</i> | 45 | 50 |

Washington State Ranking - Retail Natural Gas Prices

| | YTD 2002 | 2001 | 2000 | 1999 |
|-------------|-----------------|-------------|-------------|-------------|
| Residential | na | 26 | 37 | 35 |
| Commercial | na | 23 | 34 | 33 |
| Industrial | na | na | 42 | 46 |

50 = lowest, 1 = highest, Numbers in italics are estimates, na- not available

7. How do retail electricity and natural gas price increases affect Washington's "average" household and commercial business?

Estimated average monthly electricity bills have increased about 30 percent for residential and commercial consumers from 1999 to 2001. Estimated natural gas bills increased by over 60 percent for residential consumers and over 70 percent for commercial consumers from 1999 to 2001 (2002 data are not available).

Indicators:

- ◆ Average household and business electricity expenditures for 2002 and 1999 (these estimates assume the same level of consumption in 2002 and 1999 and do not account for inflation.)
[source: EIA]
- ◆ Average household and business natural gas expenditures for 2001 and 1999 (these estimates assume the same level of consumption in 2001 and 1999 and do not account for inflation.)
[source: EIA]

Table 4.2 Average Household and Business Utility Expenditures

| Electricity Expenditures | 1999 | 2002 Estimated | Difference |
|---|-------------|-----------------------|-------------------|
| Annual expenditures per residential customer | \$ 700.06 | \$ 889.08 | \$ 189.02 |
| Monthly expenditures per residential customer | \$ 58.34 | \$ 74.09 | \$ 15.75 |
| | | | |
| Annual expenditures per commercial customer | \$ 4,593.69 | \$ 6,063.67 | \$ 1,469.98 |
| Monthly expenditures per commercial customer | \$ 382.81 | \$ 505.31 | \$ 122.50 |

| Natural Gas Expenditures | 1999 | 2001 Estimated | Difference |
|---|-------------|-----------------------|-------------------|
| Annual expenditures per residential customer | \$ 541.13 | \$ 898.28 | \$ 357.15 |
| Monthly expenditures per residential customer | \$ 45.09 | \$ 74.86 | \$ 29.76 |
| | | | |
| Annual expenditures per commercial customer | \$ 3,063.15 | \$ 5,391.15 | \$ 2,328.00 |
| Monthly expenditures per commercial customer | \$ 255.26 | \$ 449.26 | \$ 194.00 |

The average residential household saw their monthly electricity bill increase about \$16/month from 1999 to 2002 and their monthly natural gas bill increase about \$30/month from 1999 to 2001. The average commercial business saw their monthly electricity bill increase a little more than \$120/month and their natural gas bill increased a little more than \$190/month.

Note. These values represent **statewide averages** and do not reflect the wide range of retail electricity price increases for the state's utilities ranging from less than 5 percent to more than 50 percent. In addition, retail natural gas rates have declined significantly in 2002.

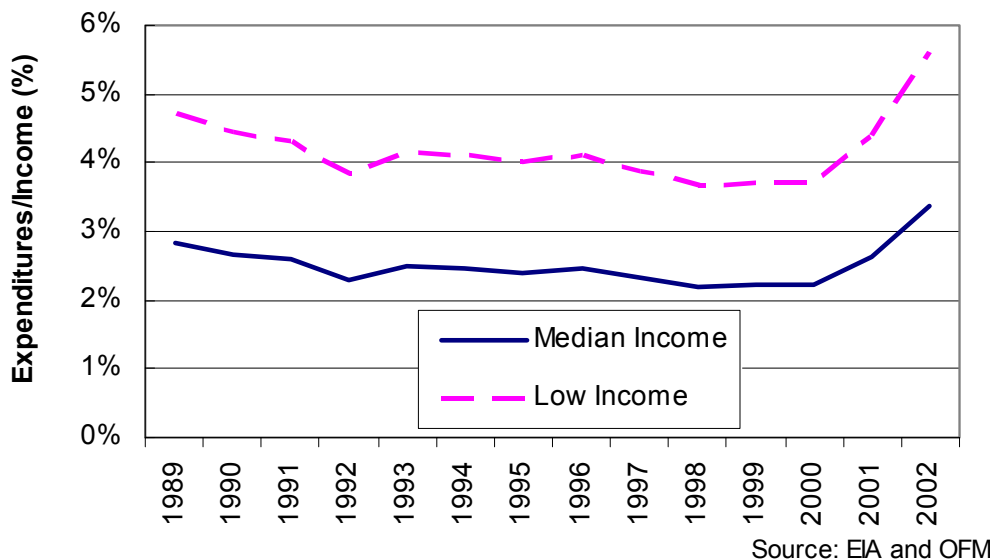
8. What is the relation of utility costs to household income?

Recent rapid increases in electricity and natural gas costs mean that households are paying a larger portion of their income for energy. This impacts low-income households the most, which on average are now paying more than 5 percent of their incomes on energy.

Indicator:

Washington household energy expenditures (this excludes energy expenditures for transportation) as a fraction of household median income. Low-income households are defined as 60 percent of median income. [source: EIA and Washington State Office of Financial Management.]

Figure 4.10 Energy Expenditures as a Fraction of Household Income



Note: Values for 2000, 2001, and 2002 are estimates.

Household energy expenditures as a fraction of median household income declined slightly during the period from 1989 through 2000. However, electricity and natural gas price increases in 2001 and 2002 have resulted in energy costs accounting for a higher percent of household income. This impacts low-income households the most. In 2002, low-income households earning 60 percent of the household median income on average paid over five and a half percent of their income on energy. This increases the need for energy assistance in these households.

9. What is the credit status of electric utilities in Washington?

Uncertainties in the utility industry and negative financial conditions have resulted in credit downgrades and negative outlooks for some utilities in the state. This increases the cost of capital, making it more difficult for utilities to make needed infrastructure investments.

Indicator:

Standard & Poor's credit ratings and outlook for the 10 electric utilities tracked in Washington.

[source: Standard and Poor's Utility Credit Ratings]

Table 4.3

| WA Electric Utilities | Rating | Outlook |
|---|---------------|----------------|
| Avista Corp. | BB+ | Stable |
| Chelan County PUD #1 | AA- | Stable |
| Clark County Public Utility District #1, WA | A | Stable |
| Douglas County PUD #1 | AA | Stable |
| Grant County PUD #2 | AA- | Stable |
| PacifiCorp | A- | Negative |
| Puget Sound Energy Inc. | BBB- | Stable |
| Seattle City Light | A | Negative |
| Snohomish County Public Utility District #1, WA | A+ | Stable |
| Tacoma Power | A+ | Negative |

All the Washington electric utilities tracked by Standard & Poor's have investment grade credit ratings (BBB or better) except Avista Corporation, although Puget Sound Energy is barely maintaining an investment grade rating. As of October 2002, half of the utilities had a negative outlook, suggesting that there is potential for their financial outlook and credit rating to deteriorate further. The remaining five (all public utilities) had stable outlooks and A or better ratings. Since October, Avista Corporation and Puget Sound Energy had their outlook upgraded to stable.

The situation in Washington reflects the utility industry nationally. In the third quarter of 2002, there were 57 credit downgrades of utility holding companies and their operating subsidiaries, compared with just eight upgrades. At the end of September 2002, 11 percent of the industry had a credit rating below investment grade and 49 percent had a BBB rating. This compares to 5 percent and 40 percent a year ago³.

³ From "Downward Credit Pressure Continues on U.S. Power Industry," Standard & Poor's Ratings Direct, October, 11, 2002.

Section 4-3: Electricity and Natural Gas Consumption in Washington

A key aspect of understanding the electricity situation in Washington is to consider growth in electricity consumption. This study uses two indicators: the historical trend in electricity use by sector and the relation between electricity consumption and expenditures to economic activity in the state.

Electricity use in Washington has been growing modestly over the last 20 years at an average annual rate of less than two percent, but in the last several years industrial use has declined by almost a third. Electricity expenditures relative to Washington's gross state product have declined steadily since the early 1980's. Likewise, commercial and industrial energy consumption per employee has declined significantly in the last ten years. These trends reflect a shift to less energy intensive businesses and industries.

Electricity and natural gas consumption and costs are closely related because natural gas-fired generation plants are a key source of new generation capacity in Washington. To illustrate this we have developed an indicator that shows historical natural gas use by sector including natural gas use for electricity generation. Since the early 1980's natural gas consumption has tripled, with growth in industrial consumption leading the way. But in the last several years, there has also been a large increase in natural gas use for electricity generation, which now accounts for almost a quarter of total natural gas consumption.

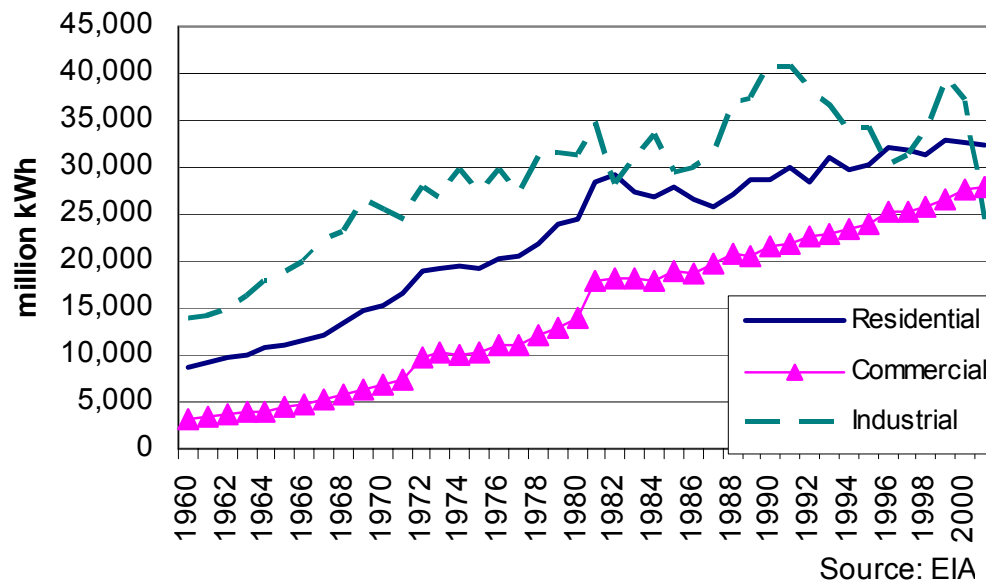
10. Where is growth occurring in electricity consumption in the state?

Historically, electricity use in Washington State has been growing, but recently industrial use has declined while residential and commercial use has remained relatively constant.

Indicators:

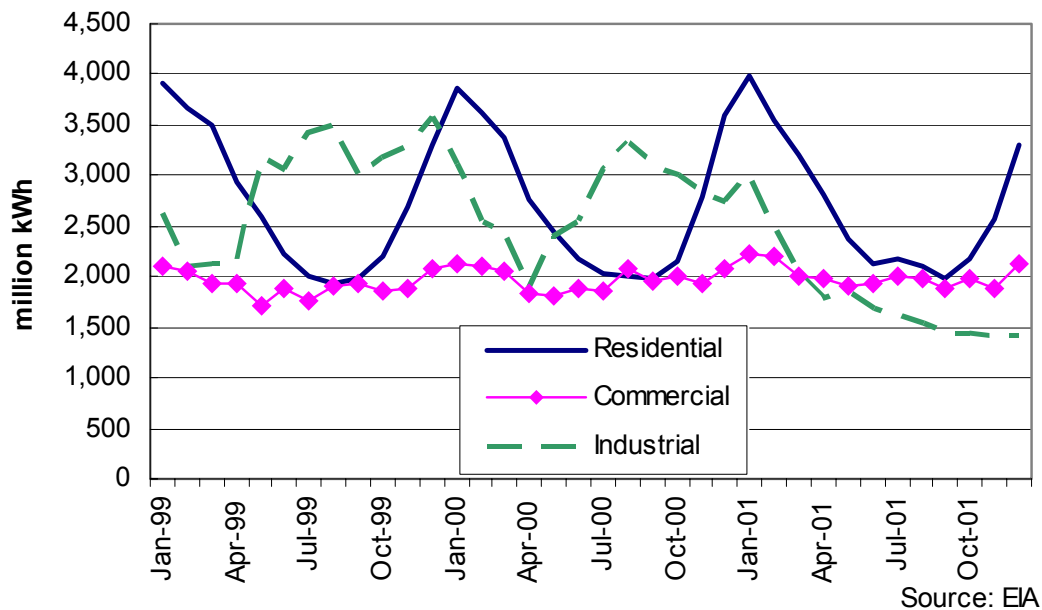
- ◆ Historical annual electricity consumption in Washington State by sector. [source: EIA]
- ◆ Recent monthly electricity consumption in Washington State by sector. [source: EIA]

Figure 4.11 Washington Historical Electricity Consumption by Sector



Electricity consumption in Washington has grown steadily over the last several decades and by 1999 was almost four times greater than in 1960. But this growth in overall electricity use reversed in 2001 due to a significant decline in industrial electricity use. The industrial sector accounted for the largest share of consumption from 1960 to 1999, but over the last decade consumption in the sector has varied by almost 25 percent. The recent decline in consumption is largely due to the shutdown of aluminum smelters in Washington. In 2001, the residential sector had the highest level of electricity consumption, accounting for a little more than a third of total electricity consumption, with the commercial sector accounting for a third of consumption, and the industrial sector a little less than a third.

Figure 4.12 Washington Monthly Electricity Retail Sales by Sector



Monthly residential and commercial electricity consumption over the last several years shows similar patterns and levels of use. Residential monthly electricity consumption peaks in the winter months reflecting increased use for space heating, while commercial use is relatively steady throughout the year. Industrial electricity use tails off significantly in 2001, mostly due to the shutdown of aluminum smelters in the state. As a result, annual electricity consumption in 2001 for both the residential and commercial sectors exceeds industrial use for the first time.

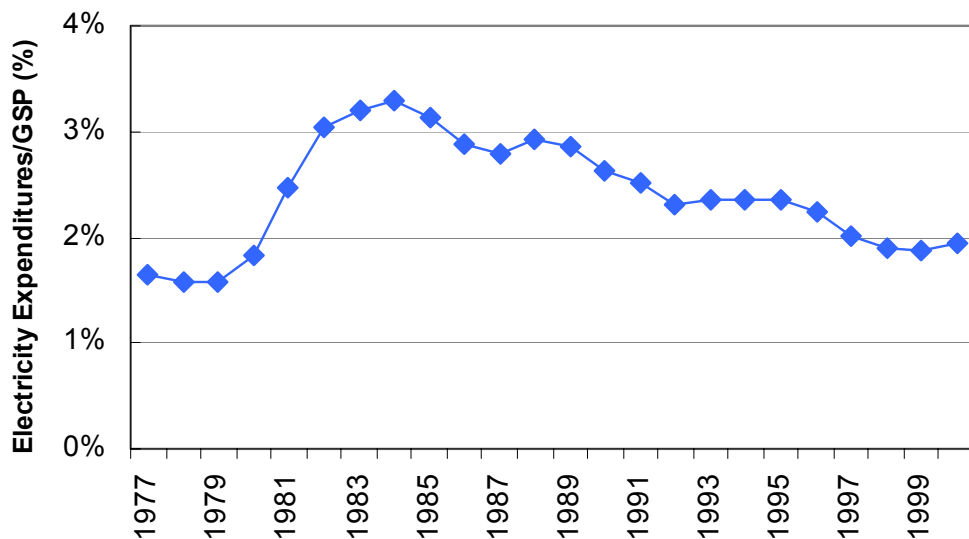
11. How does growth in electricity consumption and expenditures relate to other economic indicators?

Historically, electricity expenditures and consumption have been declining relative to gross state product and employment.

Indicators:

- ◆ Historical Washington State electricity expenditures per gross state product. [source: EIA, U.S. Department of Commerce Bureau of Economic Analysis, and U.S. Census Bureau]
- ◆ Historical Washington State commercial and industrial electricity use per employee. [source: EIA, Washington State Department of Employment Security]

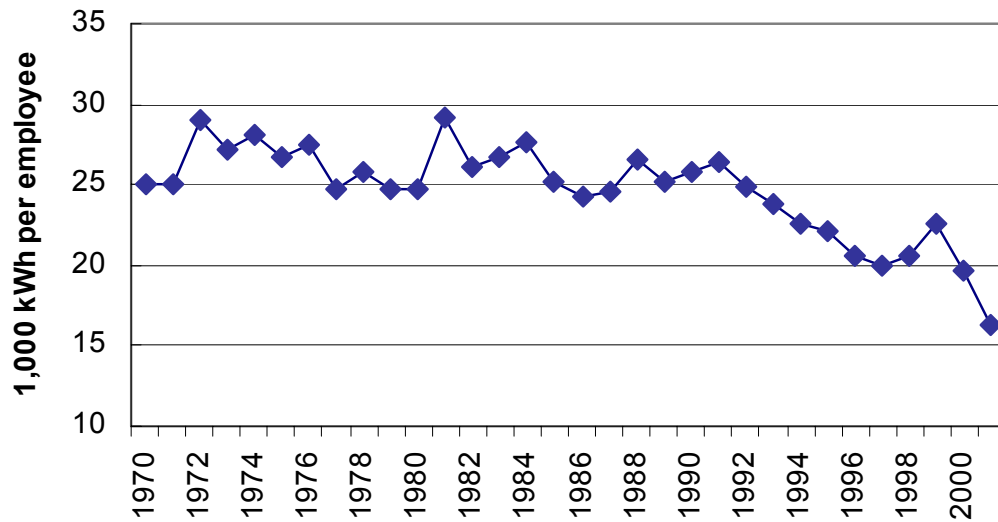
Figure 4.13 Electricity Expenditures per Dollar of Washington Gross State Product



Source: EIA, BEA, Census Bureau

Electricity expenditures per dollar of Washington State gross state product grew in the late 1970's and early 1980's, largely due to significant electricity price increases during this period. But energy expenditures per GSP declined steadily from the peak in 1984 through 1999. This was due in part to relatively stable electricity prices during this period while the economy continued to grow. It also may reflect shifts in the economy to less energy intensive industries and services. Recent increases in electricity prices are likely to reverse the downward trend in energy expenditures per GSP.

Figure 4.14 Energy Intensity: Electricity Consumption and Employment



Note: Based on electricity consumption data
for commercial and industrial sectors only

Source: EIA, ESD

Electricity consumption in the commercial and industrial sectors relative to state employment has declined fairly significantly in the last ten years. This likely reflects a shift to less energy intensive industries.

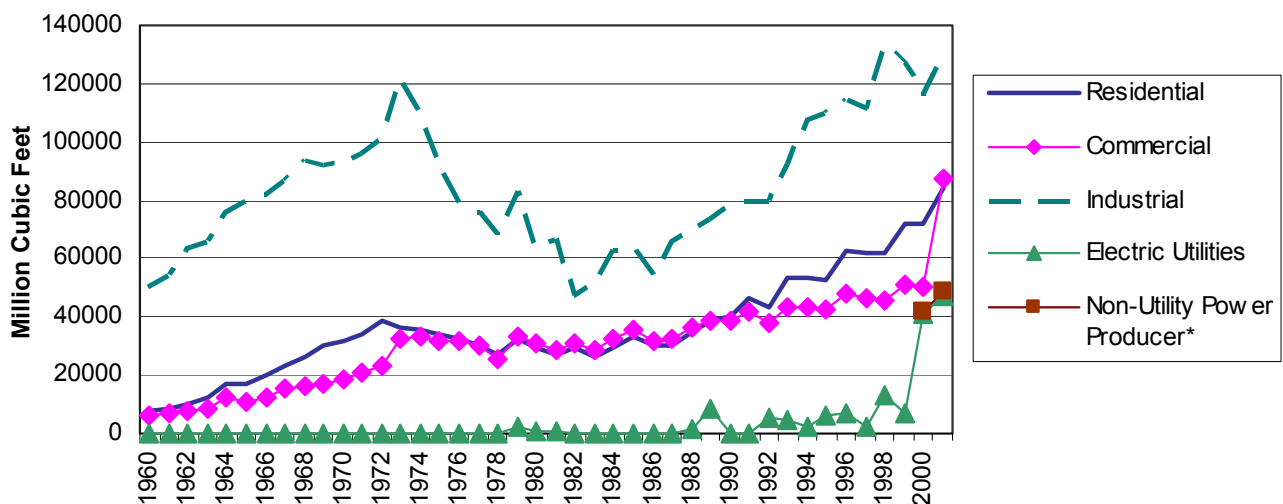
12. Where is growth occurring in natural gas consumption in the state? Is there any evidence of increasing consumption for electricity generation?

Total natural gas consumption in Washington State has tripled since the early 1980's. In the last several years, an increase in the use of natural gas for electricity generation has contributed to this increase.

Indicators:

- ◆ Historical Washington State natural gas consumption by sector including use for electricity generation. [source: EIA]
- ◆ Historical natural gas deliveries to electric power generators in Washington. [source: EIA]

Figure 4.15 Washington Historical Natural Gas Consumption by Sector

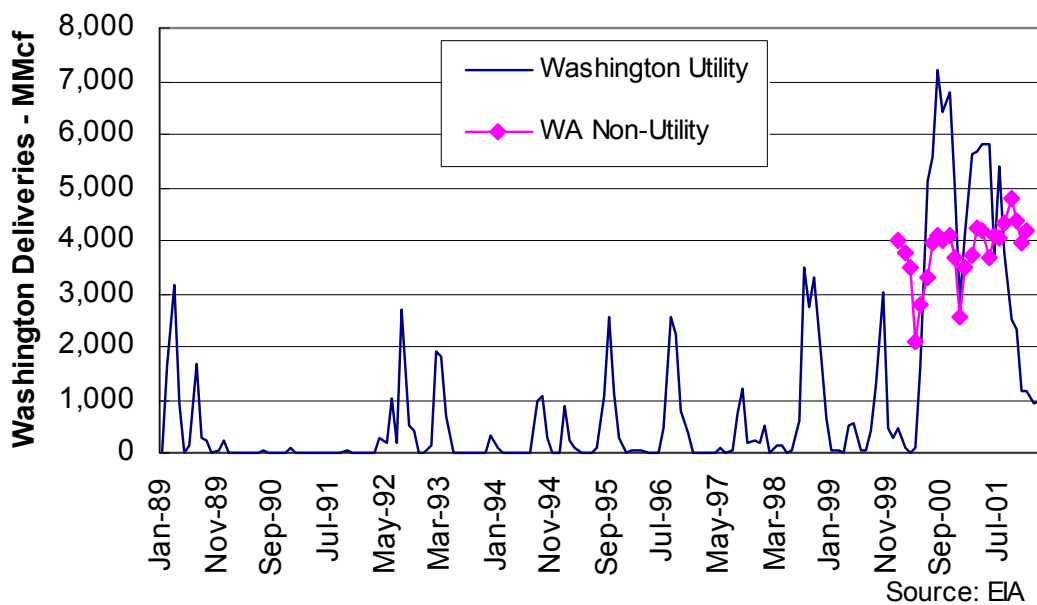


Source: EIA

*Note: Data for non-utility generators is only available for 2000 and 2001.

Natural gas consumption in Washington State has grown significantly since the early 1980's and is now more than three times greater than the value in 1982 and 1983. Currently industrial consumption accounts for about a third of total use and residential and commercial use account for a little more than 20 percent of total use each. Electricity generation accounts for almost a quarter of use. Natural gas use by utilities for electricity generation was seven times greater in 2001 than in 1999. Consumption of natural gas by non-utility generators also likely grew during this period, but data are not available prior to 2000.

Figure 4.16 Natural Gas Deliveries to Electric Power Generators in Washington



*Note: Data for non-utility generators is only available for 2000 and 2001.

Historically, electric utilities have used natural gas-fired power plants largely for use during periods of peak demand or when adequate supplies were not available from other sources. During the last several years, the use of natural gas for electricity generation has grown. Data for natural gas use by non-utility generators is not available prior to 2000, although generation from these sources has mostly occurred in recent years.

Section 4: Energy Policy Issues and Indicators

The recent West Coast energy crisis and the state energy strategy review process have raised a number of important energy policy issues related to the electricity situation in Washington. This section considers six indicators to illustrate some of these policy issues:

- ◆ mix of utility types in Washington;
- ◆ diversity of new electricity generation;
- ◆ transmission line construction;
- ◆ impact of energy use on the production of greenhouse gases;, the level of energy conservation savings; and
- ◆ percentage of electricity consumed in Washington that is produced from renewable sources.

A unique aspect of the electric utility industry in Washington relative to most states is that publicly-owned utilities account for more than half of Washington State's customers and electricity sales to end-users. This has energy policy implications because these public utilities are accountable to locally elected boards rather than the state utility commission. Almost all of the new electricity generation in Washington is produced from natural gas power plants. While this diversifies our existing mix of generation, we are dependent on one fuel source for our new generation.

Transmission line construction has been minimal since 1987. The consumption of fossil fuels (primarily petroleum for transportation) is the primary source of greenhouse gases in Washington, although electricity generation from fossil fuel sources (particularly coal) is a significant contributor. Savings from energy efficiency programs have gone up and down over the last 20 years. After reaching a high in 1993, savings declined over 70 percent by 1999, before approaching the historical high in 2001. Only a very small fraction (less than 2 percent) of the electricity provided to Washington consumers by electric utilities was generated from renewable energy sources (biomass, geothermal, wind, or solar).

13. What is the mix of utility types in Washington?

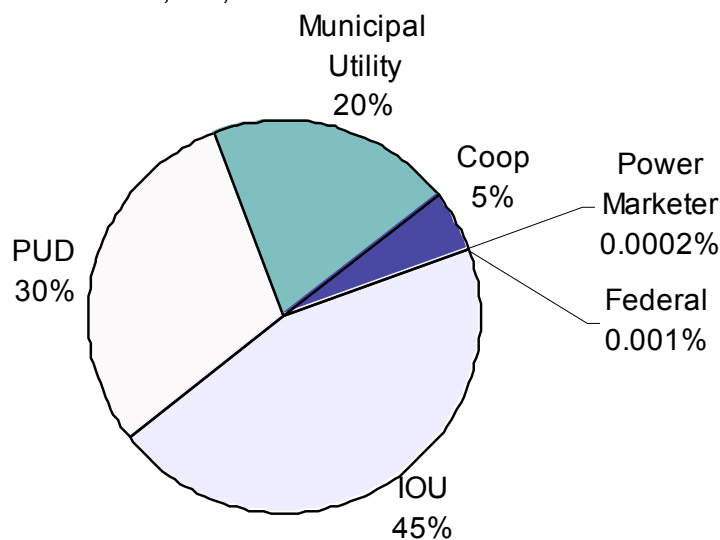
Publicly-owned utilities account for more than half of Washington State's customers and electricity sales to end-users. These utilities are accountable to locally elected boards rather than the state utility commission. Washington State has 63 electric utilities whose customers range from a few hundred customers to more than 800,000.

Indicators:

- ♦ Washington State utility customers in 2000 by type of ownership. [source: EIA]
- ♦ Washington State utility electricity sales to end-users in 2000 by type of ownership. [source: EIA]

Figure 4.17 Washington Electric Utility Customer Share in 2000 by Class of Ownership

Total number of Customers = 2,752,288

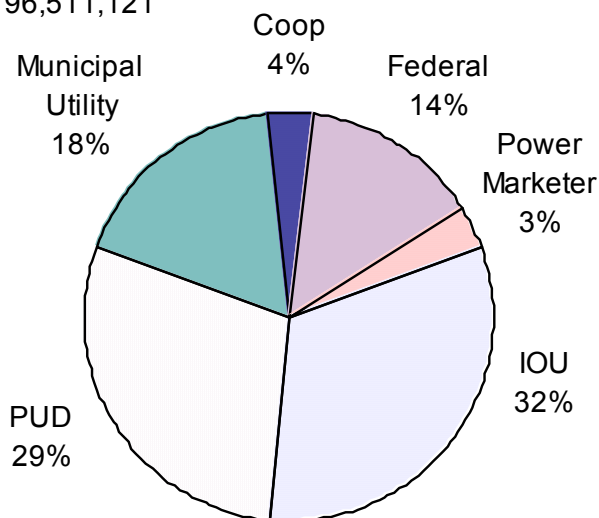


Source: EIA Electric Sales and Revenue Report

Investor-owned utilities serve a little less than half of the electric utility customers in Washington. Consumer-owned utilities (PUDs, municipal utilities, and cooperatives) account for most of the remaining customers. The small fraction attributed to 'Federal' reflects the small number of large industries directly served by BPA.

Figure 4.18 Washington State Electricity Sales in 2000 by Class of Ownership

Total MWh Sales = 96,511,121



Source: EIA Electric Sales and Revenue Report

In terms of electricity sales to end-use customers in 2000, public utilities accounted for a little more than half of the sales. Investor-owned utilities accounted for about a third of sales. Even though the BPA (federal-share) serves much less than 1 percent of the end-use customers (Direct Service Industries), the large volume of consumption for these customers adds up to almost 14 percent of sales. We have selected the year 2000 as a historically representative period prior to the nearly total shutdown of direct service industrial (aluminum industry) loads in 2001 and 2002.

14. How does new generation influence the diversity of generation in the state?

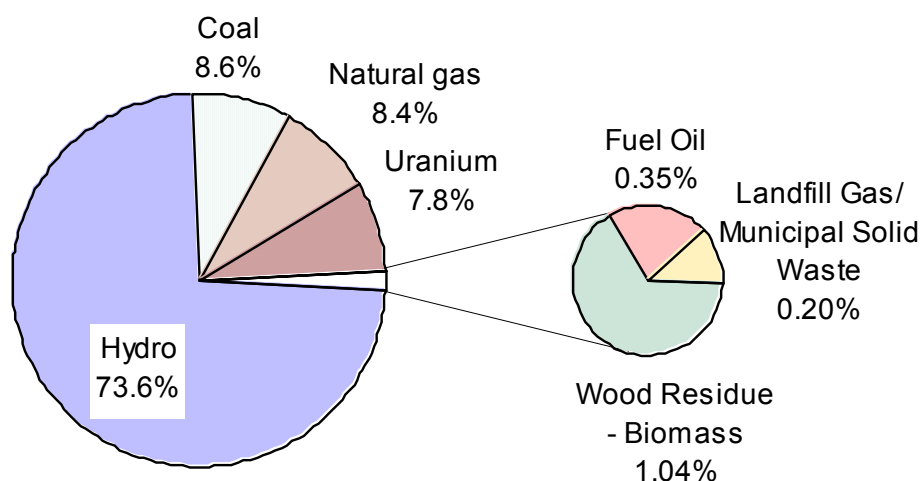
Electricity generation in Washington is dominated by hydroelectric production, but new generation is predominately fueled by natural gas. Thus, the future generation mix will have a higher proportion of natural gas fueled generation and the hydroelectric share will decline, although it will still account for more than 60 percent of in-state electricity production.

Indicators:

- ♦ Washington's existing electricity generation capacity by type of fuel based on actual generation in 2000, which was a relatively typical year. [source: Washington's fuel mix disclosure database]
- ♦ Washington's new electricity generation capacity by type of fuel based on additions since June 2001 and plants currently under construction using estimated capacity factors. [source: NWPPC]
- ♦ Washington's projected electricity generation capacity by type of fuel based on a combination of the existing capacity and new capacity. [source: Washington's fuel mix disclosure database and NWPPC]

Figure 4.19 Washington's Existing Generation Fuel Mix

Total = 110,491,500 MWh



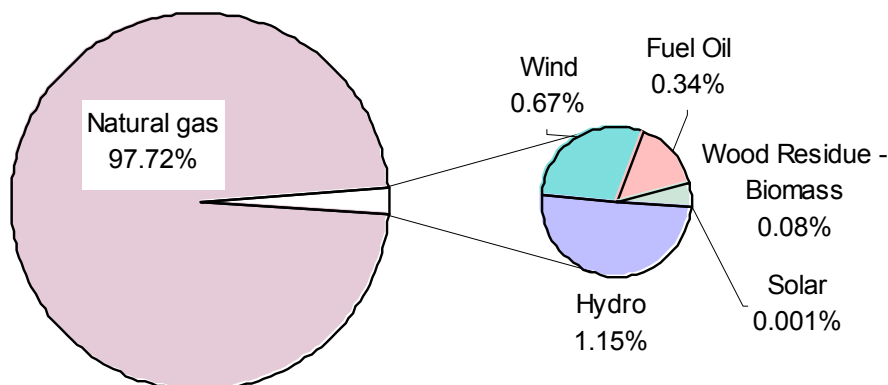
Source: Fuel Mix Disclosure Database

Washington's existing generation fuel mix is portrayed using actual generation data from 2000. This is a relatively typical year, and given the variable nature of hydroelectric generation, this is representative of the current generation fuel mix in the state. Almost three-quarters of the electricity generated in Washington State in 2000 were produced by hydroelectric power plants. Natural gas, coal-fired, and nuclear (uranium) power plants each account for about eight percent of electricity generation. A mix of fuel types make up the remaining one and a half percent of electricity generation in Washington.

Note. This figure represents electricity generated in Washington State. This differs from electricity generated or purchased by utilities in Washington State for consumption by Washington consumers.

Figure 4.20 New Generation Mix

Total = 20,723,100 MWh



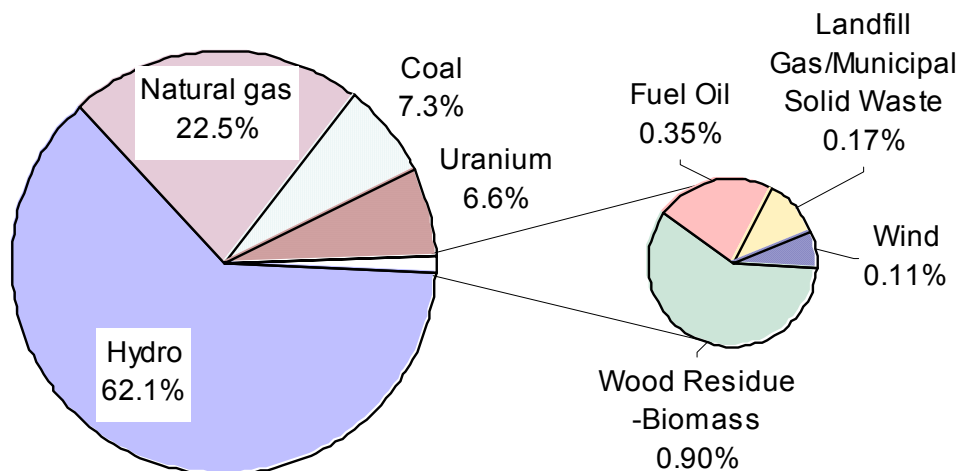
Note: New generation includes additions since June 2001, and plants currently under construction.

Source: NWPPC

Natural gas fired power plants account for almost all of the new generation capacity being added in Washington State. The remaining percentage of new generation is mostly a mix of hydro, wind, and diesel generators. Note that the electricity production from these plants is based on estimated capacity factors. Actual electricity generation from these new power plants will vary depending on electricity demand and energy market conditions.

Figure 4.21 Existing and New Generation Fuel Mix (Hypothetical)

Total = 131,214,700 MWh



Source: Fuel Mix Disclosure Database and NWPPC

This figure illustrates a hypothetical future electricity generation mix for Washington State based on the combination of the existing generation mix plus the new generation. In this illustration, the share for natural gas-fired generation increases to almost a quarter of the generation mix, while the shares for hydro, coal, and uranium decline. Hydro still accounts for over half of the generation capacity. Note that the actual future generation mix will depend on electricity demand, energy market conditions, and stream flows for hydro generation. Some existing capacity may be displaced by new generation capacity.

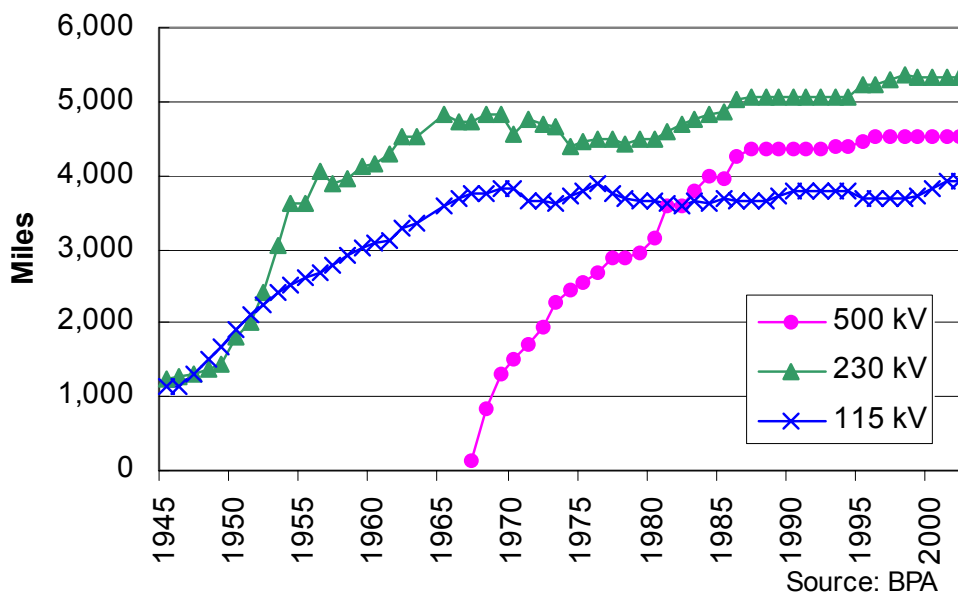
15. What is happening with the region's transmission system?

Very few circuit miles have been added to BPA's transmission system since 1987.

Indicator:

Operating circuit miles by line voltage in the BPA territory. [source: BPA]

Figure 4.22 BPA Transmission Line Construction



New transmission construction has been replaced in the last 14 years by additional reactive support and other mechanical and operational changes that allow the existing system to transmit more power. BPA is the major provider of transmission in the region. The existing transmission system is being pushed close to its limits and BPA has identified the need for significant upgrades to ensure future system reliability. Since BPA owns 75-80 percent of the high-voltage transmission in the Northwest Figure 4.22 uses BPA activity as a proxy for the region.

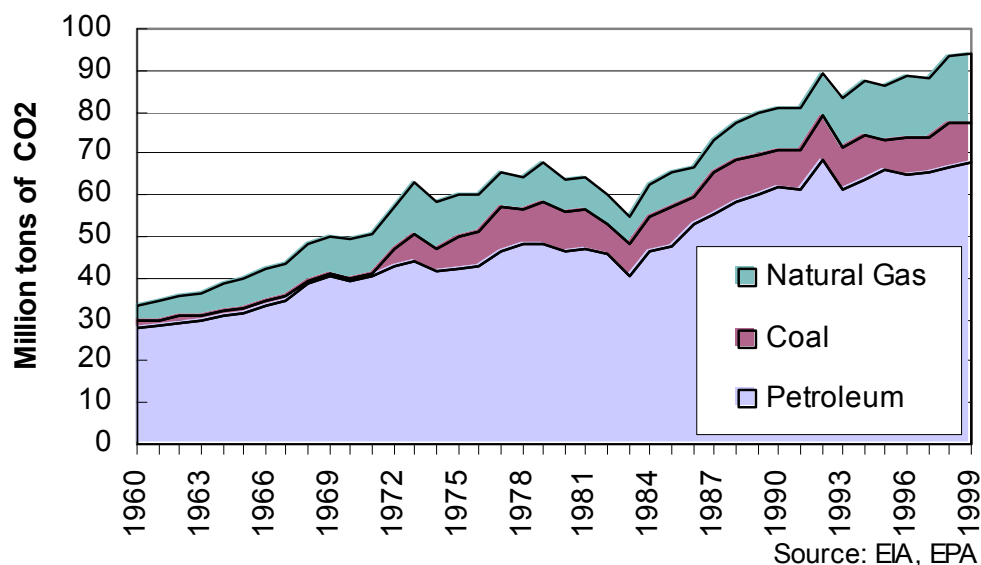
16. What is the impact of energy consumption in Washington on the production of greenhouse gases?

The production of greenhouse gas from energy use has grown significantly over the last 40 years. Consumption of petroleum products (primarily for transportation) is the major contributor to greenhouse gases in Washington. Electricity generation from fossil fuel sources (coal and natural gas) also contribute.

Indicator:

Carbon Dioxide emissions (the key greenhouse gas) from the consumption of energy in Washington State. [source: EIA]

Figure 4.23 Carbon Dioxide Emissions from Energy Use by Source



Carbon dioxide emissions from energy use have almost tripled in the last 40 years. This reflects increased consumption of fossil fuels in Washington State. Emissions from the consumption of petroleum (primarily for transportation) account for over two-thirds of total emissions. The consumption of fossil fuels (coal and natural gas) for electricity generation also contributes to greenhouse gas production. The majority of emissions from coal use are due to electricity production at the Centralia generating station.

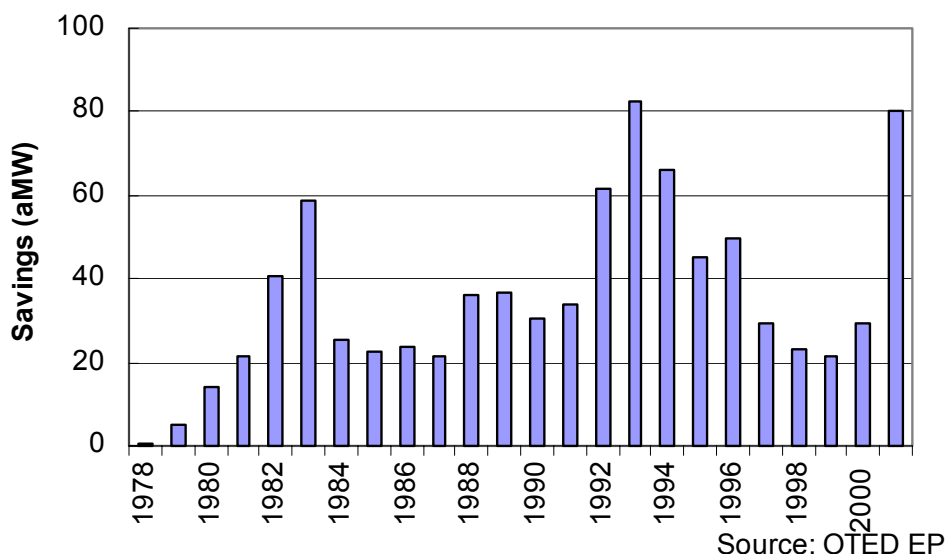
17. What is the level of energy conservation savings achieved in Washington?

The level of energy conservation savings in Washington has declined since the early 1990's, but jumped dramatically in 2001 in response to the West Coast energy crisis.

Indicator:

Historical energy conservation savings achieved by Washington utility energy efficiency programs. Note that 50 percent of the regional savings from BPA investments that is not apportioned to the region's ten major utilities is allocated to Washington for the estimate below. [source: NWPPC]

Figure 4.24 Washington Annual Savings for Electric Efficiency



Savings from energy efficiency programs in Washington State have fluctuated significantly over the last 20 years, peaking in 1983, 1993, and 2001. After reaching a high in 1993, savings declined over 70 percent by 1999. This trend reversed in 2000 and savings in 2001 approached the historical high. Initial projections indicate savings will be less in 2002.

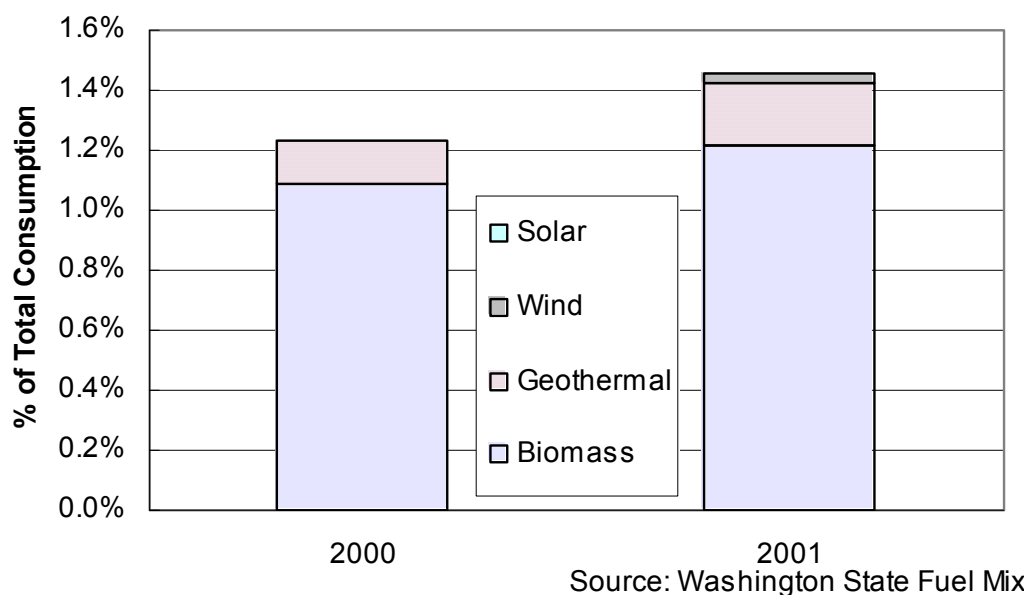
18. What percentage of the electricity consumed in Washington is produced from non hydroelectric renewable energy sources?

The portion of electricity from non-hydroelectric renewable generation sources that was consumed in Washington in 2001 was less than 1.5 percent of total consumption. Biomass is the largest renewable generation source. Electricity from wind generation accounts for less than half of a tenth of a percent of total consumption, but prior to 2001, there was no generation from this source.

Indicator:

The share of electricity sales from utilities to Washington consumers apportioned to renewable generation sources in the fuel mix disclosure reporting process. The renewable sources include biomass, geothermal, wind, and solar. Hydroelectric generation plant upgrades are also renewable, but are not included because they cannot be tracked in the fuel mix disclosure process. [source: Washington's fuel mix disclosure database]

Figure 4.25 Electricity Consumption in Washington from Renewable Sources



The amount of electricity attributed to renewable sources that was sold to consumers in Washington State in 2001 was less than 1.5 percent of total consumption. Biomass accounts for most of the renewable electricity sales with geothermal accounting for most of the rest. There were no electricity sales from solar generation sources and 2001 is the first year there were sales from wind generation. There is a modest increase in the portion of renewable sales from 2000 to 2001, but total consumption in 2001 was less than in 2000 and the magnitude of renewable sales was also less.